THE CLINICAL PATTERN OF PELVIC FRACTURES IN OUR LOCAL POPULATION

By Y. C. Lee and K. Q. Yeo

SYNOPSIS

144 cases of fractures of the pelvis seen at orthopaedic 'C' Unit, Outram Road General Hospital, Singapore between 1966 and 1968 are analysed with regard to the sex, age and racial distribution, causation, type of fracture, associated bony and soft tissue complications and their recovery. Shock as the most important complication is highlighted and recent views of its treatment in these patients discussed.

INTRODUCTION

Although several series of pelvic fractures have been published overseas, there has not been much work done to examine the clinical pattern of these fractures in our local population. The aim of the present study is to elucidate the clinical characteristics of pelvic fractures in our local population and to discuss some aspects of its management.

MATERIALS

All cases of fractures of the pelvis seen in the orthopaedic 'C' Unit, Outram Road General Hospital and confirmed by radiographs, for the period 1966 to 1968, were included in this study. As the anatomical pelvis includes both the innominate bones, the sacrum and the coccyx, fractures of the sacrum and coccyx were included.

METHOD

A total of 144 cases were reviewed and radiographs studied. Analysis was then carried out with regard to their sex, age and racial distribution. Special attention was paid to the cause of the fractures, the types of fractures sustained, the associated bony and soft tissue complications and their recovery.

In classifying the fractures of the pelvis a method of classification modified after G. Apley and Watson Jones[1, 6] was adopted. In studying the recovery a minimum follow up period of one month was decided upon, even in cases of minor injury. Those in which the follow up was less than one month or who had no proper record kept was listed as inadequately followed up and therefore not used.

Department of Surgery, University of Singapore.
Y. C. LEE, M.B., B.S., Surgical Trainee.

Department of Orthopaedic Surgery, University of Singapore.
K. Q. YEO, M.B., B.S., Orthopaedic Trainee.

RESULTS

(a) Incidence

Although the frequency of pelvic fractures in relation to fractures in other parts of the human skeleton cannot be ascertained in this study some indication of the importance of this condition can be noted when the frequency of the pelvic fractures is compared with the frequency of all other pelvic conditions (Orthopaedic) seen over the same period (Table I). About 85% of all pelvic conditions are fractures of the pelvis. It is therefore, the commonest pelvic condition encountered in orthopaedic surgery.

(b) Sex Incidence (Table II)

There is a predominance of males over females. The male to female ratio is 2:1.

(c) Age Incidence (Fig. 1.)

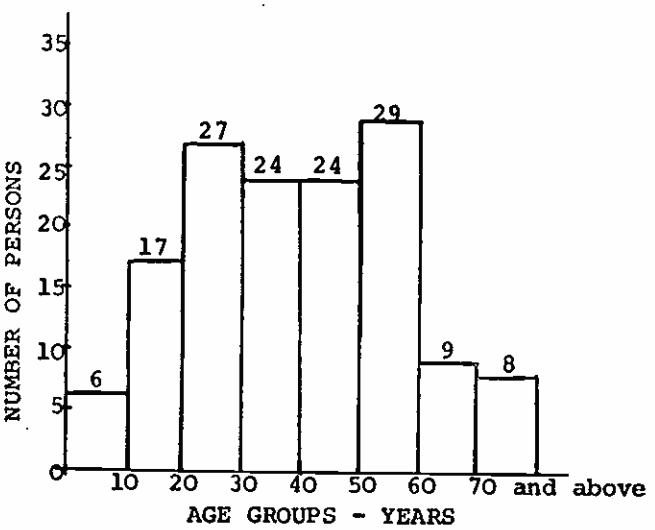

Fig. 1. Age incidence.

TABLE I

ALL PELVIC CONDITIONS SEEN BETWEEN 1966 — 1968

Pelvic Condition	No.	%
I. FRACTURES OF THE PELVIS	144	84·7
II. OTHER PELVIC CONDITIONS		
(i) Osteomyelitis	8	15·3
(ii) Malignancies—primary	2	
—secondary	6	
(iii) Arthritis (all types)	7	
(iv) Others	3	
TOTAL	170	100·0

TABLE II

SEX INCIDENCE

Sex	No.	%
Male	96	66·7
Female	48	33·3
TOTAL	144	100·0

TABLE III

RACIAL INCIDENCE

Race	No.	%
Malay	22	15·28
Indian	20	13·89
Chinese	101	70·14
Others	1	0·69
TOTAL	144	100· 0

TABLE IV

CAUSES

Causes	No.	%
1. Road Traffic Accident	74	51·39
2. Fall from height	52	36·11
3. Hit by falling objects	7	4·86
4. Others (including unspecified)	11	7·64
TOTAL	144	100· 0

The majority of the patients (72·2%) falls between 20 to 60 years. This injury is therefore seen mainly in the working age groups consistent perhaps with the traumatic nature of this injury.

(d) **Racial Incidence** (Table III)

Chinese form the majority of the cases but, considering that the majority of the population in Singapore is Chinese this is expected.

(e) **Causes** (Table IV)

The fractures of the pelvis have a rather narrow spectrum of causes. The majority, in fact almost all, are sustained in a road traffic accident or at work—either falling from a height or being hit by a falling object (stone, plank etc.). There are only 11 cases (7·6%) that cannot be attributed to these causes. It is therefore a predominantly industrial and transportation injury.

(f) **Types of Fractures Seen** (Table V)

Various authors have classified fractures of the pelvis in various ways and as yet there is no universally accepted classification. The classification used here is one modified after Apley. This was favoured because it takes into account the mechanisms of injury and correlates well with the clinical characteristics of the fractures.

Apley and some others have named Type II fractures as "isolated fractures,"[1, 6] but, this tends to give the impression that the fractures are single. This is by no means true, as often there are several fractures in different parts of the pelvis without disruption of the pelvic ring. We have therefore deliberately avoided the term. Fractures of the acetabulum are included in Type IIa fractures of the innominate bone. Fractures of the sacrum and coccyx are considered Type IIb fractures. The terms Type I, Type II and Type III fractures will be used in this study to indicate the particular injury referred to or under discussion.

Table VI shows the incidence of the various types of pelvic fractures seen in this series.

The majority of the fractures are Type II fractures (i.e. fractures without rupture of the pelvic ring). Of these the majority involves the innominate bone (Type IIa). About half of the Type IIa fractures are single and the other half are multiple. The Type III fractures (fracture with pelvic ring disruption) form only 10·4% and Type I (avulsion) fractures are notably rare.

(g) **Associated Fractures and Dislocations** (Tables VII and Table VIII).

Nearly half (44%) of the cases studied had fractures or dislocations of one kind or another in addition to the pelvic fracture sustained. Of these, fractures occur more frequently than dislocations.

TABLE V

FRACTURES OF THE PELVIS — CLASSIFICATION

Type of Fracture	Mechanism of Injury	Clinical Characteristics
TYPE I Avulsion Fractures	Avulsed by violent muscular action	1. Young Active Adults. 2. Apophysis avulsed:- ant. sup. iliac spine (satorius); ant. inf. iliac spine (Rectus F.); Ischial Tuberosity (Hamstrings).
TYPE II Fractures of the pelvis without ring rupture: (a) Innominate bone (b) Sacrum & coccyx	Direct force	1. Fracture in one or more sites without ring rupture. 2. Displacement slight. 3. Intrapelvic damage rare
TYPE III Fractures of the pelvis with ring rupture. (a) Compression type (b) Hinge Type (c) Vertical Type	 (a) (i) Ant. post. compression force (ii) Lateral compression force (b) Tangential force (c) Vertical force	1. Pelvic ring ruptured 2. Displacement usually gross. 3. High incidence of pelvic injury.

TABLE VI

TYPE INCIDENCE

Type of Fracture		No.	%
I. TYPE I		3	2·1
II. TYPE II	(a) Innominate bone—Single	57	87·5
	Multiple	48	
	(b) Sacrum and coccyx	21	
III. TYPE III	(a) Compression force—Ant.-post.	5	10·4
	lateral	1	
	(b) Hinge (or Tangential) force	7	
	(c) Vertical force	2	
	TOTAL	144	100

The limbs are fractured more than any other part of the skeleton, and lower limb fractures predominate. In dislocations, however, it appears that the upper limbs are more often injured. The spinal fractures are of the compression type. Skull fractures may be erroneously low as some of these may be admitted to the surgical units, although any patient with both skull and pelvic fractures would eventually be seen by the orthopaedic units for management of the latter. Some may have passed away before referal to an orthopaedic unit can be effected. Further analysis of the associated limb fractures and dislocations (Tables IX and X) show that fractures of the forearm bones are most common in the upper limb while fractures of the femur and tibia and fibula are about equal in frequency in the lower limb. In the foot, the os calcis bears the brunt of the injury. Almost all the upper limb dislocations encountered are dislocations of the shoulder joint.

(h) **Soft Tissue Complications in Fractures of the Pelvis** (Table XI)

As is true with associated fractures and dislocations, almost half of the patients (44%) had associated soft tissue injuries. The urogenital tract, when taken together, by virtue of its anatomical position in the pelvis, sustained the highest incidence of injuries (33·9%). The bladder injuries are 24% and the urethral injuries 4·9% as compared to 10 to 12% and 2·5% respectively in that of most other series[3, 11]. The head injuries followed by circulatory insufficiency (shock) came next in frequency. The long term complications like backache, pain at the site of fracture, shortening of the limbs and deformity of the pelvis leading to obstetric complications occur fairly commonly and are reflected in a study of their recovery.

(i) **Treatment**

In the treatment of patients with pelvic fractures, resuscitation, when necessary, must always take precedence before any definitive treatment of the fracture is considered. When soft tissue complications are present and more important when there are associated fractures (e.g. femur, tibia and fibula), these must take priority in treatment. The definitive treatment of the pelvic fracture follows well established orthopaedic guidelines. The Type I and II fractures are treated with analgesics till the pain subsides. The patient is then encouraged to become ambulent with or without support and then gradually guided back to normal activity. Type III fractures if not grossly displaced are treated similarly. If grossly displaced reduction of the fragments, usually by continuous skeletal or skin traction in various forms, is attempted. After reduction the treatment follows the pattern des-

TABLE VII

ASSOCIATED FRACTURES

Region Affected	No.	%
Skull	2	3·8
Upper Limb	14	26·4
Lower Limb (except Pelvis)	23	43·4
Rib Cage	7	13·2
Spine	7	13·2
TOTAL	53	100·0

TABLE VIII

ASSOCIATED DISLOCATIONS

Region Affected	No.	%
Upper Limb	6	60
Lower Limb	4	40
TOTAL	10	100

TABLE IX

TYPES OF FRACTURES SEEN

Type of Fracture	No.	
Upper Limb		
1. Scapular	1	14
2. Clavicle	2	
3. Radius and Ulnar	2	
4. Colles	7	
5. Carpus (Scaphoid)	1	
6. Humerus	1	
Lower Limb		
1. Femur	9	23
2. Tibia and Fibula	8	
3. Os Calcis	3	
4. Metatarsus	3	
TOTAL	37	

TABLE X

TYPES OF DISLOCATION SEEN

Type of Dislocation	No.
Upper Limb	
(i) Shoulder	5
(ii) Trans-scapho-perilunar	1
Lower Limb	
(i) Hip	3
(ii) Knee	1
TOTAL	10

TABLE XI

COMPLICATIONS

Type of Complication	No.	%	
1. CIRCULATORY (Shock)	10	16·1	
2. UROGENITAL			
Bladder (contusion, rupture etc.)	15	24·2	33·9
Urethra	3	4·9	
Kidney	1	1·6	
Vulval vagina	2	3·2	
3. ABDOMEN (except Urogenital)	7	11·3	
4. CHEST	2	3·2	
5. HEAD INJURY	17	27·4	
6. OTHERS	5	8·1	
TOTAL	62	100·0	

TABLE XII

AVERAGE PERIOD OF HOSPITALIZATION

Type of Fracture	Average Length of Hospitalization
1. TYPE I	1·0 day (Range 0-3 days)
2. TYPE II	6·7 days (Range 0-90 days)
3. TYPE III (a)	14·3
(b)	17·9 — 15·6 days (range 4-37 days)
(c)	11·5

TABLE XIII

RECOVERY

Recovery	No.	%
Good	65	45·1
Fair	28	19·5
Poor	11	7·6
*Deaths	2	1·4
Inadequate follow up	38	26·4
TOTAL	144	100·0

*One died of coronary thrombosis the other of pulmonary embolism—post mortem done in both.

TABLE XIV

CORELATION OF TYPE OF FRACTURE WITH RECOVERY

Recovery	Type of Fracture		
	Type I %	Type II %	Type III %
Good	2 (66·7)	58 (46·0)	5 (33·3)
Fair	1 (33·3)	24 (19·0)	3 (20·0)
Poor	0 (—)	8 (6·4)	3 (20·0)
Deaths	0 (—)	1 (0·8)	1 (6·7)
Inadequate follow up	0 (—)	35 (27·8)	3 (20·0)
TOTAL	3 (100·0)	126 (100·0)	15 (100·0)

cribed above. As the patient stays immobilized for a longer period, physiotherapy plays a more important part here.

The treatment of acetabular fractures is controversial and presents a different problem, the discussion of which is not attempted here.

(j) **Recovery**

The average length of hospitalization of the patients depends on the severity of the fracture sustained and the complications encountered. The results of an overall survey taking into account the complications are shown in Table XII.

Patients with Type I fracture had, on an average, to be hospitalized for about 1 day (ranging from 0 to 3 days); those with Type II fractures an average of 6·7 days (ranging from 4 to 37 days).

The recovery of this series of patients was classified as good, fair or poor. It was good if they had no symptoms on follow-up (no pain or backache etc.) and had a full range of movement of the lower limbs and no deformity or shortening of the lower limbs. It was regarded as fair if they had either genuine symptoms or limitation of movement of the lower limbs or deformities of the lower limbs. It was poor if they had a combination of two or more of the above (i.e. symptoms and limitations of movements and/or deformities).

Of the 144 patients in the series 106 (73·6%) had adequate follow-up enabling proper assessment while 38 patients either absconded or were followed up inadequately. The degree of recovery is shown in Table XIII.

If correlated with the types of fractures they sustained (Table XIV) one finds that the patients with Type I and II fractures had better recovery than the Type III fractures.

(k) **Discussion**

The above series has shown that fractures of the pelvis occur commonly in the working age group, more among males than females, and during travelling or at work. With rapid industrialization and high velocity transportation the incidence of pelvic injuries will surely increase.

It is perhaps pertinent to point out that although the fractures are by themselves not a danger to life, the often associated bony injuries and soft tissue complications make them more treacherous than it often appears. The incidence of shock in this study is only 16% taking third place infrequency. In many other series [4, 5, 8, 9, 10, 12] haemorrhagic shock was the most frequently encountered complication or the major cause of mortality. This may be due to the difference in criteria used and the care one takes in diagnosing shock. Whatever the incidence may be, haemorrhagic shock is undoubtedly the most important complication. This is too often forgotten or overlooked, till late in the course of treatment. Haemoperitoneum is suggested by signs of acute peritonism and fluid levels. Retroperitoneal haemorrhage and haematoma may be very difficult to diagnose. In such cases a cystouretherogram may show displacement of the bladder.

The treatment of a straightforward intraperitoneal haemorrhage is by laparotomy and surgical haemostasis. When confronted by an enlarging retroperitoneal haematoma with a deteriorating circulatory state, the problem is no longer simple and clear cut. Locating the bleeding point or points in a retroperitoneal haematoma is more often than not unsuccessful and in such cases surgery itself may endanger life. Most surgeons would agree that retroperitoneal haematoma should be treated conservatively in the first instance. But if massive blood transfusion is inadequate then an attempt to stop the bleeding is justified. In this connection there has been much interest recently in the ligation of the internal iliac vessels as a definitive procedure in massive pelvic haemorrhage. While some (Ravitch 1964) maintain that the rich pelvic anastomosis that makes these procedures possible will in itself defeat the aim of these operations; others [5, 8, 12] (Seaves, Hamilton and Horten, Lawson and Wainwright) point out that haemostasis can occur in the damaged vessel when a period of temporary hypotension immediately following ligation is superimposed on the effects of the naturally occuring clotting mechanism. Furthermore, the ligation of the internal iliacs has been shown to produce very little acute or long term complications. The procedure seems, therefore, well worth a try in desperate instances. There were only two deaths in this series. In both, post mortems were performed. One showed coronary thrombosis and the other pulmonary embolism following deep vein thrombosis.

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